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(54) Transfer making materials

(57) Transfer making materials are described which can be used to make dry transfers using an electro-photographic copier. In use of such materials, the material is fed through a "plain paper" copier and the toner image deposited can subsequently be transferred by using the transfer materials so formed in the usual way. The material consists of a flexible transparent or translucent base sheet on which are applied two layers which may be released together and bodily from the carrier sheet. The first layer is shearable and non-tacky and the second layer is likewise shearable and substantially non-tacky but has adhesive properties.

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SPECIFICATION

Transfer making materials

This invention relates to transfer making materials.

Dry transfer materials are well known for a variety of graphic arts uses. They consist generally of a plastics film carrier, a transferable image on the carrier and adhesive acting to adhere the image to the desired receptor surface.

Classically, such transfers have been produced by various printing processes, most notably screen printing, and methods have also been developed for making such transfers by photographic methods. Both printing and photographic methods take time and require specialist equipment.

A recent development in the manufacture of transfer materials has been the introduction of transfer making materials consisting of a plastics backing sheet and a film which is substantially transparent or translucent and which can be released from the backing sheet. The film, on its side remote from the backing sheet, bears an adhesive and in order to make a transfer from such material an image is applied to the adhesive side. One particularly convenient way of applying that image is to pass the stock material through an electrophotographic copying machine of the "plain paper copier" type. In such a machine, a toner is deposited imagewise onto the adhesive surface and the toner image may subsequently be transferred to a desired receptor surface in the usual way. The base material for carrying out this process and the process generally are described in more detail in United States Patent Specification 4,171,398.

A problem with commercially available materials produced under that United States Patent is the necessity of cutting through the transferable layer before the desired area can be transferred to the desired receptor. This can be done without difficulty using an art knife, scalpel or the like, but such an operation requires some manual skill in order to carry it out and requires the person doing the cutting to work on the adhesive side of the stock material. This can lead to contamination of that material with dust and dirt, or even to unwanted adherence of parts of the stock material e.g. to the operators hands. Additionally, when the cut out area is rubbed down, using stylus pressure applied from the back of the sheet, in the usual way, if the applied pressure does not entirely cover the cut out area, corners of it remain unstuck down to the receptor while if areas outside the cut out area are rubbed down, then when the base sheet is pulled away from the receptor, adhesive contamination tends to occur around the area of the cut out transferred section. This picks up dust and dirt and renders the art work unsightly.

We have now found that these disadvantages may be avoided by careful selection of the thicknesses of the adhesive and non-adhesive transferable layers and by care in formulating them so that they have the right mechanical properties, particularly shear strength properties.

According to the present invention there is provided a transfer making material comprising a transparent or translucent flexible backing sheet, a first layer on one side of the sheet and a second layer on the side of the first layer remote from the backing sheet, the first layer being formed of a colourless transparent or translucent non-tacky, shearable film and the second layer being formed of a substantially colourless, transparent or translucent very low tack adhesive, the formulation and respective thicknesses of the first and second layer being such that both layers may be transferred bodily to a desired receptor surface under the action of a substantial applied pressure through the carrier sheet when the adhesive layer is laid against the desired receptor to which it desired to transfer the two layers.

By suitably formulating the first and second layer and choosing a suitable thickness, materials may be produced in which the film-strength of the combined first and second layers is sufficient to enable large areas of the combined layers to be transferred as a whole and without rupture of the combined layers save at the edges of the area, after pressure has been applied from the rear-side of the carrier sheet e.g. using a stylus over a general defined large area.

Such a material may be used for making a transfer material where passing it through an electrophotographic copier of the "plain paper" type, in which an image of toner material is transferred to the second layer. The material is then used as a transfer material in the normal way.

The individual components of the transfer making material will now be considered, but it must first of all be observed that there is a general requirement on all components that they should be substantially unaffected or at least not adversely affected by passing the transfer making material through an electrophotographic copier. In particular, care needs to be taken to use materials which are relatively stable under the conditions of time and temperature encountered during the passage of such material through an electrophotographic copier.

The carrier sheet may be any convenient flexible sheet material which is substantially transparent or translucent. A wide variety of such carrier sheets is known and used in the manufacture of various dry transfer lettering materials. Treated papers may be used but preferably the carrier sheet consists of a transparent or translucent plastics film e.g. of polyethylene, polystyrene butadiene or polyethylene terephthalate. The surface of the film to which the two layers are applied must have appropriate characteristics enabling the layers to be removed cleanly and in order to achieve this with films which do not inherently possess such properties, the carrier sheet may be surface treated or coated appropriately, e.g. with a layer of release coating to assist release of the transferable layers.

The first layer should be a shearable film-forming layer which can be pulled cleanly away from the carrier sheet by the second layer. A wide variety of film-forming materials may be used as a basis for this layer, but the material of choice is a cellulosic film-forming material, particularly a nitro-cellulose film. The shearability of such film layers may be improved by adding shear ingredients to the coating compositions from which they are laid down, e.g. silica or other particulate filler or wax. The thickness of the first layer is preferably 0.5 to 2 microns.

The layer of adhesive over the first layer may comprise a substantially tacky polymer as a base material together with de-tackifying agents which may also, in some cases, assist shearability. In particular, the adhesive layer may be based on a polyvinylether tacky polymer or a polyisobutylene together with wax material and/or finely divided mineral material (e.g. silica) to reduce the tack and/or promote shear. The thickness of the adhesive coating is preferably 0.5 to 2 microns.

The total thickness of both applied coatings is preferably within the range of 2 to 4 microns, and within this range one coating may be thicker at the expense of the other. The two coatings should, of course, be compatible so that there is no tendency for the adhesive coating to separate from the first layer which might leave exposed adhesive on a surface to which a transfer has been applied. In the manufacture, the thickness may vary with the materials used and will clearly be a compromise between the ability to coat the layers evenly at the thickness in question and making the layers thin enough so that they shear easily to give a usable transfer material.

Preferably the adhesive is a so-called "pressure-activated" type i.e. one which has a very low or negligible surface tack but which, when burnished down under high applied pressure, has a high adhesive power to surfaces such as art board and cellulose acetate film.

In coating the first layer on to the carrier sheet, care must of course be taken to avoid interaction between the first coating and the carrier sheet which would act against their clean separation. This is most easily done by coating the first layer from a solution in a solvent which neither dissolves nor swells the material of the carrier sheet, or of any release coating that may be present on the carrier sheet.

The following Examples will serve to illustrate the invention:

EXAMPLE 1

A carrier film was taken of 75 micron thick polyethylene terephthalate film (Melinex 542 ex I.C.I.). This was coated on one side by Meyer bar coating with a layer of release coating composition consisting of the following ingredients in the following proportions by weight:

Polystyrene resin (number average molecular weight 10,000 Lustrex Lx 4300 Ex Monsanto)		20.2%
Calcium carbonate (Calopak F fine calcite, ex Sturge)		4.9%
Antistatic Agent (ASA 3 ex Shell)		0.2%
Ethyl acetate	Solvent	34.6%
Xylene	Solvent	34.6%
Oxitol	Solvent	5.5%

This composition was coated at a wet coating thickness of 30 microns and then dried by hot air drying at 80°C to give a final coating thickness of 7 microns.

On to the dried first coating there was applied by Meyer bar coating a transferable layer from a coating composition consisting of the following ingredients in the following proportions by weight:

Nitrocellulose (30% by weight damped with isopropanol, DHX 30/50 ex I.C.I.)	11.87%
Plasticizer (Paraplex RGA2 ex Rohm & Haas)	4.95%
Silica (oleophilic grade Aerosil R972, ex Degussa)	3.85%
Oxitol	75.77%
Butyl oxitol	3.46%
Silicone anti-foam agent (MS200 1% by weight in white spirit ex Midland Silicones)	0.1%

This composition was coated at a wet coating thickness of 9 microns and then hot air dried with an air temperature of 65°C to give a final coating thickness of 1.5 microns.

After drying this coating an adhesive coating was applied from a coating composition consisting of the following ingredients in the following proportions by weight:

Polybutene (number average molecular weight 2,400 Hyvis 200 ex B.P. Chemicals)	3.6%
Polyisobutylene (viscosity average molecular weight 380,000, Oppanol B50 ex BASF)	1.7%
Polyethylene wax (number average molecular weight 2,000 melting point 104—108°C ACP6 ex Allied Chemical Corporation)	2.6%
Silica (Aerosil R972 as above)	2.1%
Aliphatic hydrocarbon solvent (Exsol D145/160 ex Esso)	86.1%
Oxitol	3.9%

This composition was coated by Meyer bar coating to give a wet coating thickness of 15 microns which was dried by hot air drying at 65°C to give a dry coating thickness of 1.5 microns.

For storage this material was cut up into sheets and the sheets then interleaved with siliconised vegetable parchment sheets of basis weight 43 gsm.

When required for use, the sheets were taken and separated from the interleaving sheets of vegetable parchment and stacked in the in-feed tray of a Nashua electrophotographic copier. A master sheet containing various patterns and symbols was then laid on the platen of the copier and copies made in the usual way. Black toner was deposited imagewise on the exposed adhesive coating and the so-processed material could easily be handled after passing through the copier. In order to transfer individual images from the now image-bearing material, the sheet bearing the images was laid, toner side down, onto a sheet of Bristol board or art board and the back of the carrier sheet rubbed over in the area of each symbol it was desired to transfer, using a stylus or burnishing tool. The images formed of xerographic toner transferred together with both applied layers cleanly and clearly to the receptor surface without noticeable adhesive contamination.

EXAMPLE 2

Example 1 was repeated but instead of the nitrocellulose-based coating composition used in Example 1, a coating was used of the following ingredients in the following proportions by weight:

Nitrocellulose (as Example 1)	10.29%
Plasticizer (as Example 1)	4.29%
Polyethylene was (as used in adhesive in Example 1)	1.67%
Silicone anti-foam agent (as Example 1)	0.08%
Hydrocarbon solvent (as in adhesive of Example 1)	15.00%
Oxitol	65.67%
Butyl oxitol	3.00%

This composition was applied by Meyer bar coating and dried to give a dry coating weight of 1.6 gsm. The adhesive was applied to give a coating weight of 1.8 gsm when dry.

Similar satisfactory results were obtained.

The performance of the materials of the above Examples could be yet further improved by applying a light coating to the side of the carrier sheet remote from the adhesive which acts as a slip coating and assists in reducing static. This assists in guaranteeing satisfactory mechanical transport through the photocopier. A suitable slip coating is an acrylic resin base coating formulated with some wax material, and a typical dry coating thickness of such a layer is 3 to 6 microns.

The words Melinex, Lustrex, Calopak, Paraplex, Aerosil, Oppanol, Exsol and Nashua used herein are Registered Trade Marks.

CLAIMS

1. A transfer making material comprising a transparent or translucent flexible backing sheet, a first layer on one side of the sheet and a second layer on the side of the first layer remote from the backing sheet, the first layer being formed of a colourless transparent or translucent, non-tacky shearable film and the second layer being formed of a substantially colourless transparent or translucent very low tack adhesive, the formulation and respective thicknesses of the first and second layers being such that both layers may be transferred bodily to a desired receptor surface under the action of a substantial applied pressure through the carrier sheet when the adhesive layer is laid against the desired receptor to which it is desired to transfer the two layers.

2. A transfer making material according to claim 1 wherein the thickness of the first layer is 0.5 to 2 microns.

3. A transfer making material according to claim 1 or 2 wherein the thickness of the adhesive layer is 0.5 to 2 microns.

4. A transfer making material according to any of claims 1 to 3 wherein the total thickness of the first and second layer amounts to 2 to 4 microns.

5. A transfer making material according to any of claims 1 to 4 wherein the carrier sheet consists

of release coated polyethylene terephthalate film.

6. A transfer making material according to any of claims 1 to 5 wherein the adhesive consists essentially of a substantially tacky polymer and one or more de-tackifying agents.

7. A transfer making material according to claim 6 wherein the de-tackifying agents are one or more of waxes and finely divided mineral materials.

8. A transfer making material according to claim 1 and substantially as hereinbefore described with reference to either of the foregoing specific Examples.

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